

WHAT IS CLAIMED IS:

1. An ink jet head driving apparatus comprising:
a drive signal generating unit which outputs
a drive signal for ejecting an ink droplet to an ink
jet head having a pressure chamber which contains
an ink, a nozzle which communicates with the pressure
chamber and ejects the ink in the pressure chamber, and
an actuator which changes a capacity of the pressure
chamber to be expanded or contracted based on the drive
signal, wherein
the drive signal generating unit sequentially
generates as drive signals for ejecting ink droplets:
a first pulse in the shape of a first rectangular
wave, which expands the capacity of the pressure
chamber;
a second pulse in the shape of a second
rectangular wave, which contracts the capacity of
the pressure chamber;
a third pulse in the shape of a third rectangular
wave, which expands the capacity of the pressure
chamber; and
a fourth pulse in the shape of a fourth
rectangular wave, which contracts the capacity of the
pressure chamber, and
a time interval between a pulse width center of
the first pulse and a pulse width center of the third
pulse is set to 1AL (1AL is 1/2 of an acoustic resonant

cycle of the ink in the pressure chamber), and a time interval between a pulse width center of the second pulse and a pulse width center of the fourth pulse is set to 1AL.

5 2. An ink jet head driving apparatus according to claim 1, wherein a ratio between a pulse width of the first pulse and a pulse width of the third pulse; and a ratio between a pulse width of the second pulse and a pulse width of the fourth pulse are determined,
10 respectively, according to a damping rate of residual vibration of the ink in the pressure chamber.

 3. An ink jet head driving apparatus according to claim 1, wherein a pulse width of the first pulse is set to be equal to a pulse width of the third pulse and
15 a pulse width of the second pulse is set to be equal to a pulse width of the fourth pulse, and a ratio between a voltage amplitude of the first pulse and a voltage amplitude of the third pulse and a ratio between a voltage amplitude of the second pulse and a voltage
20 amplitude of the fourth pulse are determined, respectively, according to a damping rate of residual vibration of the ink in the pressure chamber.

 4. An ink jet head driving apparatus according to claim 1, wherein the drive signal generating unit
25 sequentially generates the first pulse to the fourth pulse, so that a plurality of ink droplets are ejected by repeatedly generating the first to fourth pulses

resulting in adhering at one point on a recording medium, whereby one pixel is formed.

5 5. An ink jet head driving apparatus comprising:
a drive signal generating unit which outputs a
drive signal for ejecting an ink droplet to an ink jet
head having a pressure chamber which contains an ink,
a nozzle which communicates with the pressure chamber
and ejects the ink in the pressure chamber, and an
actuator which changes a capacity of the pressure
10 chamber to be expanded or contracted based on the drive
signal, wherein

the drive signal generating unit sequentially
generates as drive signals for ejecting ink droplets:

15 a first pulse in the shape of a first rectangular
wave, which expands the capacity of the pressure
chamber;

a second pulse in the shape of a second
rectangular wave, which contracts the capacity of
the pressure chamber;

20 a third pulse in the shape of a third rectangular
wave, which has a pulse width of a predetermined rate
with respect to a pulse width of the first pulse, and
expands the capacity of the pressure chamber; and

25 a fourth pulse in the shape of a fourth rectangular
wave, which has a pulse width of a predetermined
rate with respect to a pulse width of the second pulse,
and contracts the capacity of the pressure chamber,

a sum of the pulse width of the first pulse and the pulse width of the second pulse is constant, and

a rate of the pulse width of the first pulse and the pulse width of the second pulse is obtained as
5 a value according to a desired ejection volume.

6. An ink jet head driving apparatus according to claim 5, wherein the drive signal generating unit sequentially generates the first pulse to the fourth pulse, so that a plurality of ink droplets are ejected
10 by repeatedly generating the first to fourth pulses resulting in adhering at one point on a recording medium, whereby one pixel is formed.

7. An ink jet head driving apparatus comprising:
a drive signal generating unit which outputs a
15 drive signal for ejecting an ink droplet to an ink jet head having a pressure chamber which contains an ink, a nozzle which communicates with the pressure chamber and ejects the ink in the pressure chamber, and an actuator which changes a capacity of the pressure chamber to be
20 expanded or contracted based on the drive signal, wherein

the drive signal generating unit sequentially generates as drive signals for ejecting ink droplets:

a first drive signal in which a first pulse in
25 the shape of a first rectangular wave expanding the capacity of the pressure chamber, a second pulse in the shape of a second rectangular wave contracting

the capacity of the pressure chamber, a third pulse in the shape of a third rectangular wave expanding the capacity of the pressure chamber, and a fourth pulse in the shape of a fourth rectangular wave contracting the capacity of the pressure chamber are sequentially generated, and in which a time interval between a pulse width center of the first pulse and a pulse width center of the third pulse is set to $1AL$ ($1AL$ is $1/2$ of an acoustic resonant cycle of the ink in the pressure chamber), and a time interval between the pulse width center of the second pulse and a pulse width center of the fourth pulse is set to $1AL$; and

a second drive signal in which a fifth pulse in the shape of a fifth rectangular wave, the fifth pulse expanding the capacity of the pressure chamber, and a sixth pulse in the shape of a sixth rectangular wave contracting the capacity of the pressure chamber are sequentially generated with a predetermined wait time being provided therebetween, and in which a time interval between a pulse width center of the fifth pulse and a pulse width center of the sixth pulse is set to $2AL$, and the first drive signal and/or the second drive signal are selectively output according to an ejection volume of ink droplets.

8. An ink jet head driving apparatus according to claim 7, wherein, the drive signal generating unit maintains a sum of a pulse width of the first pulse and

a pulse width of the second pulse of the first drive
signal at a constant value, and changes a volume of
each ink droplet to be ejected, by varying a ratio
between the pulse width of the first pulse and the
5 pulse width of the second pulse.